

Satoshi TAMANO et al., S.N. 10/563,086
Page 8

Dkt. 1141/75586

REMARKS

The application has been reviewed in light of the final Office Action dated October 9, 2007. Claims 1, 2, 4 and 6-14 were pending, with claims 3 and 5 having previously been canceled, without prejudice or disclaimer. By this Amendment, claims 11, 13 and 14 have been canceled, without prejudice or disclaimer, and claims 1 and 2 have been amended to include the features formerly recited in now-canceled claim 14. Applicant submits that no new matter and no new issues are introduced by the claim amendments. Accordingly, claims 1, 2, 4, 6-10 and 12 would be pending upon entry of this Amendment, with claims 1 and 2 being in independent form.

The specification was objected to as purportedly not providing antecedent basis for the claimed subject matter.

The Office Action indicates that consecutive ID numbers of the vibrator elements is not disclosed in the specification. However, the Office Action acknowledges that the drawings show consecutive ID numbers of the vibrator elements.

By this Amendment, the specification has been amended to reference the consecutive ID numbers of the vibrator elements shown in the drawings.

Withdrawal of the objection to the specification is requested.

Claim 1 was rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 6,171,248 to Hossack et al. Claims 2-14 were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Hossack in view of U.S. Patent No. 5,291,892 to O'Donnell.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claims 1 and 2 are patentable over the cited art, for at least the following reasons.

Satoshi TAMANO et al., S.N. 10/563,086
Page 9

Dkt. 1141/75586

The present application relates to an ultrasonic probe which can be used with an ultrasonic diagnostic apparatus and can be inserted into a body cavity for collecting ultrasonic images of the entire circumference of 360 degrees in the body cavity.

In conventional probes, the scanning by the ultrasonic waves is usually performed within the fan of 110 degrees in right and left directions. For example, the ultrasonic waves are scanned in the right direction and after reaching the end vibrator element in the right direction, the scanning direction is reversed and shifted in the left direction. Likewise, when the ultrasonic waves reach the end vibrator element in the left direction, the scanning direction is again reversed and shifted in the right direction and such is repeated until scanning is completed.

Applicant devised an improved ultrasonic probe wherein a plurality of vibrator elements are disposed in an array at the tip of the insert section around entire 360 degree outer circumference of the probe. Applicant determined that unidirectional scanning of 360 degrees is preferable as compared to scanning in right and left directions mentioned above. In such unidirectional scanning, each vibrator element in the array is assigned a consecutive ID number, and the connection change over switch connects a first vibrator element having a lowest ID number and a second vibrator element having a highest ID number to respective corresponding ultrasonic wave transmission and reception channels each having a predetermined delay time so as to permit successive scanning of the plurality of vibrator elements, from the first vibrator element having the lowest ID number in an order of increasing ID number through remaining vibrator elements in the array to the second vibrator element having the highest ID number, and then from the second vibrator element having the highest ID number to the first vibrator element having the lowest ID number. Each of independent claims 1 and 2 as amended addresses these features, as well as additional features. Thus, the unidirectional scanning continues from the

Satoshi TAMANO et al., S.N. 10/563,086
Page 10

Dkt. 1141/75586

vibrator element having the highest ID number to the vibrator element having the lowest ID number, since the disposition of the plurality of vibrator elements around an entire outer circumference of the probe places the vibrator element having the highest ID number to the vibrator element.

It is contended in the Office Action (in connection with now-canceled claim 14) that Hossack, column 3, lines 52-54 (reproduced below), purportedly proposes that each of the plurality of vibrator elements is assigned a consecutive ID number.

A first ultrasonic transducer array 20 ("first array 20") and a second ultrasonic transducer array 22 ("second array 22") are provided in the distal end region 18 of the probe 10. ...

Thus, Hossack, column 3, lines 52-54, contrary to the contention in the Office Action, merely proposes that a first ultrasonic transducer array 20 and a second ultrasonic transducer array 22 are provided in the distal end region 18 of the probe 10.

Further, Hossack, claim 1 (column 10, lines 4-28), which was also cited in the Office Action, is reproduced below:

1. A method for registering image information acquired from an interior region of a patient, said method comprising the steps of:

(a) inserting an ultrasonic probe into a patient to image an interior region of the patient, the ultrasonic probe having a body having a longitudinal axis, a circumference and a distal end region, a first ultrasound array disposed in the distal end region of the body and a second ultrasound array disposed in the distal end region of the body;

(b) acquiring a plurality of sets of image data with the first ultrasound array, the first ultrasound array moved between acquisition of at least some of the sets of image data;

(c) acquiring a plurality of sets of tracking data with the second ultrasound array, the second ultrasound array moved between acquisition of at least some of the sets of tracking data;

(d) automatically determining a component of motion based on a comparison of at least a portion of the tracking sets acquired in step (c); and

(e) automatically using the component of motion determined in step to register

Satoshi TAMANO et al., S.N. 10/563,086
Page 11

Dkt. 1141/75586

select ones of the image data sets acquired in step (b).

Contrary to the contention in the Office Action, Hossack says nothing whatsoever regarding consecutive ID numbers assigned to the elements of the transducer array.

Likewise, Hossack does not disclose or suggest that the connection change over switch connects a first vibrator element having a lowest ID number and a second vibrator element having a highest ID number to respective corresponding ultrasonic wave transmission and reception channels each having a predetermined delay time so as to permit *successive scanning of the plurality of vibrator elements, from the first vibrator element having the lowest ID number in an order of increasing ID number through remaining vibrator elements in the array to the second vibrator element having the highest ID number, and then from the second vibrator element having the highest ID number to the first vibrator element having the lowest ID number.*

O'Donnell, as understood by Applicant, proposes a system for performing ultrasound flow imaging. However, the system of O'Donnell does not involve an ultrasonic probe and does not have a plurality of vibrator elements disposed in an array at the tip of the insert section around entire 360 degree outer circumference of the probe.

Therefore, the combination of Hossack and O'Donnell does not teach or suggest the ultrasonic probe of independent claims 1 and 2.

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 1 and 2 of the present application, and the claims depending therefrom, are patentable over the cited art.

Independent claims 1 and 2 (and the claims depending therefrom) are patentable over the

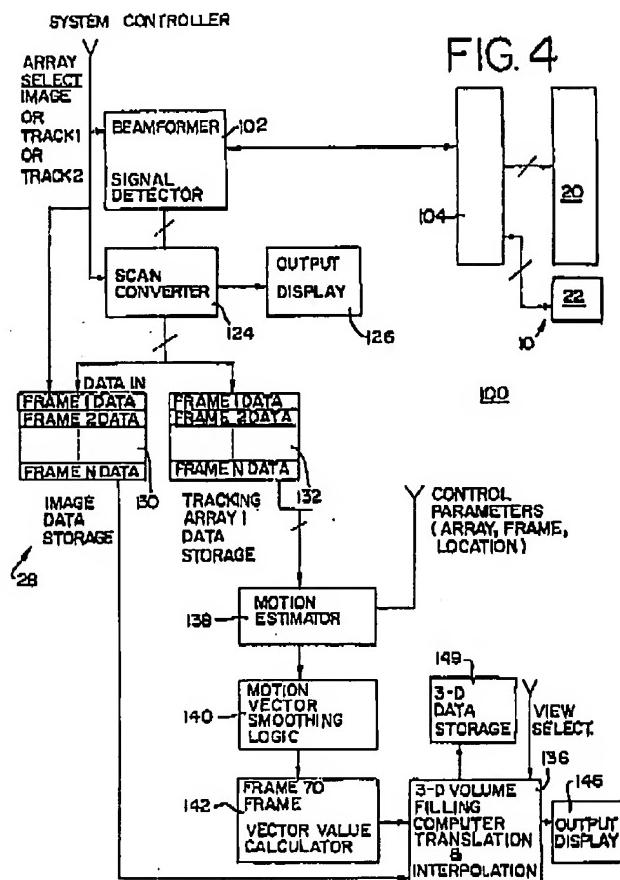
Satoshi TAMANO et al., S.N. 10/563,086
Page 12

Dkt. 1141/75586

cited art for other reasons as well.

The system controller referenced in Fig. 4 of Hossack is equated in the Office Action with the connection change over switch of independent claims 1 and 2 of the present application.

However, Fig. 4 (reproduced below) of Hossack shows a block diagram of an ultrasonic imaging system:



Hossack, column 5, lines 50-54 (reproduced below), describes the system shown in Fig. 4:

The system 100 includes a beamformer system/signal detector 102 which

Satoshi TAMANO et al., S.N. 10/563,086
Page 13

Dkt. 1141/75586

includes both transmit and receive beamformers and is connected via a multiplexer/demultiplexer 104 to an ultrasonic probe 10 such as that shown in FIG. 1.

...

Thus, the beamformer system/signal detector 102, which is separate from the ultrasonic probe 10, is connected via a multiplexer/demultiplexer 104 to the probe 10. Further, the "system controller", as shown in Fig. 4 of Hossack, merely supplies a signal described in Fig. 4 as "ARRAY SELECT IMAGE OR TRACK1 OR TRACK2" and is not coupled to any components of the probe 10.

Clearly, both the "system controller" and the beamformer system/signal detector 102 are elements of the ultrasonic imaging system 100 of Hossack and not elements of the probe 10 of Hossack. Therefore, the contention in the Office Action equating the system controller and the beamformer system/signal detector 102 of Hossack with a connection change over switch (or another element) in an ultrasonic probe is simply meritless.

The cited art simply does not disclose or suggest an ultrasonic probe comprising connection change over switch is constituted in such a manner that the respective plurality of the vibrator elements are connectable with any one of a predetermined number of ultrasonic wave transmission and reception channels for transmitting and receiving ultrasonic wave signals in an ultrasonic diagnostic apparatus main body, and the connection change over switch successively changes over electrical connection of a predetermined number of vibrator elements among the plurality of vibrator elements to be connected with the predetermined number of ultrasonic wave transmission and reception channels (independent claims 1 and 2 of the present application).

Independent claim 2 is patentable over the cited art additionally for the following reason.

O'Donnell does not disclose or suggest the connection change over switch is ON and

Satoshi TAMANO et al., S.N. 10/563,086
Page 14

Dkt. 1141/75586

OFF controlled so that the delay time of ultrasonic wave signal transmitted and received by a vibrator element located at the center of second array of the predetermined number of the vibrator elements being connected at respective times assumes the maximum and the delay times of ultrasonic wave signals transmitted and received are distributed in a symmetric manner with reference to the center. As pointed out above, O'Donnell does not involve an ultrasonic probe.

O'Donnell merely proposes that by changing the imparted time delay, the amount of downward directing angle with respect to the central axis 21 can be varied.

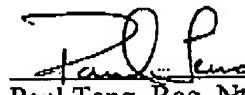
Hossack, contrary to the contention in the Office Action, does not discloses "the respective times of the time delay being determined by the beamformer system/signal detector."

In view of the remarks hereinabove, Applicant submits that the application is now in condition for allowance, and earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,



Paul Teng, Reg. No. 40,837
Attorney for Applicant
Cooper & Dunham LLP
Tel.: (212) 278-0400